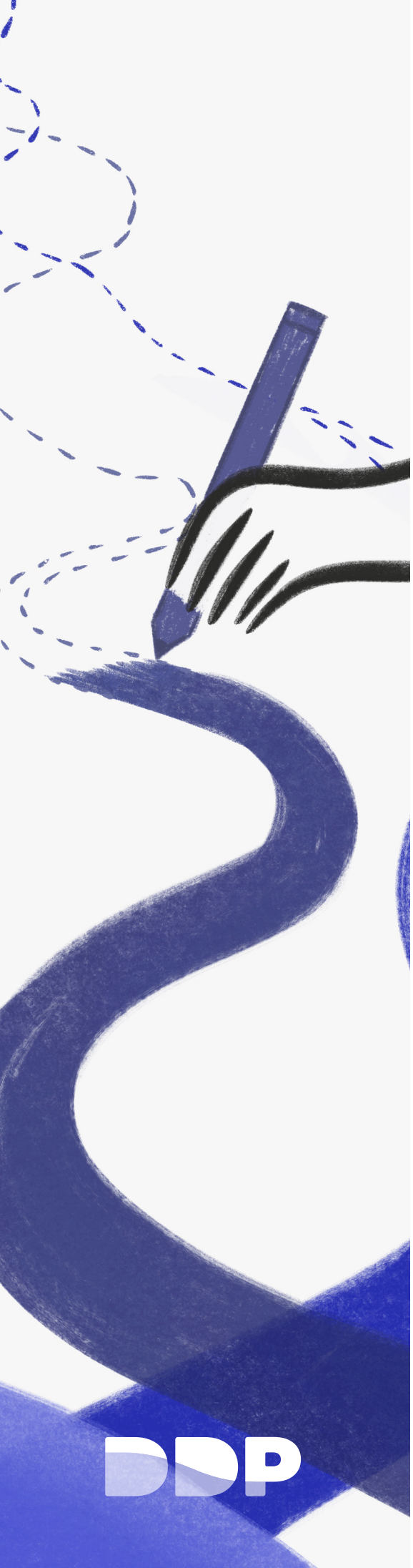


UNITED STATES
A DECADE OF CLIMATE ACTION SINCE THE PARIS AGREEMENT

Alicia Zhao, Kiara Ordonez Olazabal, Laura Hinkle, Claire Squire, Christoph Bertram, Ryna Cui, Nate Hultman (UMD)

INTRODUCTION

In the decade following the Paris Agreement, the United States continued a trend of reducing economy-wide greenhouse gas emissions from their peak in 2007 to a level approximately 17% below its base year of 2005. While recognizing this partial progress, the pace of reductions has been too slow to reach the initial U.S. 2025 NDC and is currently slower than needed to reach the 2030 target. Policy and market actions in the United States have been characterized by a temporally shifting patchwork of policies across sectors and gases, at both national and subnational levels, that have occasionally driven major and comprehensive expansions of low-emissions investments and technologies and have at other times reversed course to slow clean technology deployment and support expansion of fossil fuel use and infrastructure. In parallel, U.S. engagement and support for the multilateral UNFCCC and Paris architecture has oscillated from being a core driver of international action to several levels of antipathy ranging from withdrawal to active antagonism. Such whipsawing has, of course, created major obstacles for the type of rapid energy and economic transition needed to support national and global climate outcomes consistent with the goals of the Paris Agreement. In this shifting patchwork of policies and associated chal-

lenges, several factors have stood out as areas of strength. First, there has been relatively consistent climate leadership from a diverse set of subnational governments and other actors, notably U.S. states who have substantial policy authorities in certain sectors such as electricity and buildings. In the highly federalized U.S. system, such actions can, over time, both significantly shift the aggregate level of emissions, and also demonstrate successful policy strategies that can build political consensus toward a broader application—both through federal action and larger coalitions of subnational action. Second, the occasional forceful policies backed by large amounts of federal investments and industrial policies have, in some significant spurts, supported more major infrastructure investments and rapid deployment of renewable energy. Third, and relatedly, the dramatic global reductions in costs for solar PV, wind, batteries, EVs, and other key technologies have shifted the market dynamics substantially in the United States, to the point where some technologies currently outcompete conventional and dirtier technologies even without policy support. These factors can all potentially form the core of continued and eventually accelerated action, but ultimately this will depend on larger and unpredictable political developments. Therefore, the overall situation in the United States has raised questions about the U.S. role in international mechanisms as well as its ability to carry out the level of domestic actions to drive domestic reductions across all sectors and gases at a sufficient pace.

U.S. POLICY EVOLUTION 2015–2025

At the federal level, the alternating agendas of the Obama, Trump and Biden administrations have limited the U.S.'s ability to deliver consistent global leadership under the Paris Agreement, while also creating challenges domestically for delivering the short-term Nationally Determined Contribution (NDC) targets and making needed progress toward long-term net-zero goals. A major effort initiating U.S. climate engagement with China, and associated U.S.-China international leadership, catalyzed greater ambition across countries and led to the successful launch of the Paris Agreement. The subsequent administration reversed course by withdrawing from the Paris Agreement, rolling back 72 federal environmental regulations and undermining climate science, triggering international criticism and domestic backlash.[1] In response, subnational coalitions like *We Are Still In* (later renamed as *America Is All In*) and the *U.S. Climate Alliance* of state governors formed to continue to advance climate action in the United States. Subnational governments continued to implement and in some cases, enhance, their climate policies.

The U.S. federal government under President Biden rejoined the Paris Agreement in 2021, set a new 2030 and 2035 NDC aligned with a 2050 net-zero target, and passed landmark climate legislation including the Bipartisan Infrastructure Law (BIL) and Inflation Reduction Act (IRA). This administration also initiated or advanced major international initiatives like the Global Methane Pledge, while subnational actors expanded clean energy standards, zero-emission vehicle mandates, and building energy efficiency policies.

However, the 2024 election reversed direction in many of these areas. Internationally, the United States re-oriented its foreign policy and its strategy toward the global economy, favoring heavy utilization of tariffs and the elimination or withdrawal from many multilateral initiatives. This included a second withdrawal from the Paris Agreement.[2] Domestically, executive orders were issued redefining U.S. energy goals,[3] propping up the coal industry,[4] asserting federal precedence over state climate policies,[5] and proposing the phaseout of environmental legislation.[6] Actions were initiated within federal agencies, as part of the executive branch, to reinterpret or eliminate regulations that had been previously implemented based on existing legislation. Broad restructuring of the federal budget and priorities led to the elimination of climate and clean energy capacities across a number of federal agencies,

including the State Department, Department of Energy, and Environmental Protection Agency, among others.[7–9] Finally, research funding for many areas, including climate, was cut.[10] Presently, the uncertainty surrounding federal climate action has delayed the implementation of climate policies across states and cities,[11] discouraged long-term private investment in clean energy technologies,[12] and strained coordination with global allies.[13,14] It has also cast doubt on whether the United States will follow through on its NDCs.

Even as these federal changes are expected to have major impacts and to slow the rate of emissions reductions across the U.S. economy, a number of subnational governments and other actors continue to implement policies and work toward their own climate goals. In the U.S. federal system, many significant policy authorities are granted to states, cities, counties, and other jurisdictions, including control over the electricity grid, building energy efficiency standards, and zoning strategies. In aggregate, subnational actors taking actions on climate constitute roughly two-thirds of the U.S. population and 75% of U.S. GDP — equivalent to the world's third largest economy.[15] The continued leadership of subnational actors has therefore remained a consistent cornerstone of U.S. climate governance and international climate diplomacy throughout the last decade even as the federal government has shifted.[16,17,18]

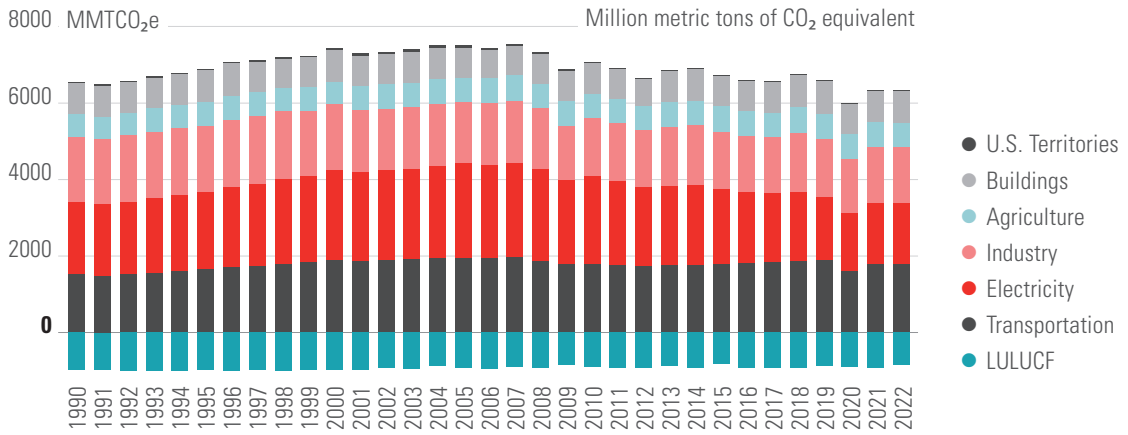
OVERALL EMISSIONS TRENDS AND DRIVERS

As of 2022, U.S. GHG emissions dropped by 17%, relative to 2005 levels (**Figure 1**). This decline reflects a mix of factors, including decarbonization in the power sector and improvements in energy efficiency.[20] The most significant drop happened in 2020 due to the impact of the COVID-19 pandemic, though emissions have stayed below 2019 levels even as the economy has recovered.

The electricity sector has driven most of these reductions, with emissions from electricity generation falling by 36% over this period (from about 2,457 MMT CO_2e in 2005 to 1,577 MMT CO_2e in 2022), due to a mix of market and policy forces that have improved energy efficiency and reduced coal use. Transportation is now the largest emitting sector, with only an 8% decline over the same period, as travel demand has grown faster than efficiency gains. Industrial emissions have lowered slightly, mainly due to a shift toward less energy-intensive production. Emissions from agriculture have roughly remained flat. Emissions from buildings went up by 8% in 2022 compared to 2005, with some year-to-year variation depending on energy use.[19]

The drop in U.S. electricity sector emissions reflects a shift from coal to natural gas and renewables in the generation mix. From 2005

Figure 1. U.S. Greenhouse Gas Emissions by Economic Sector

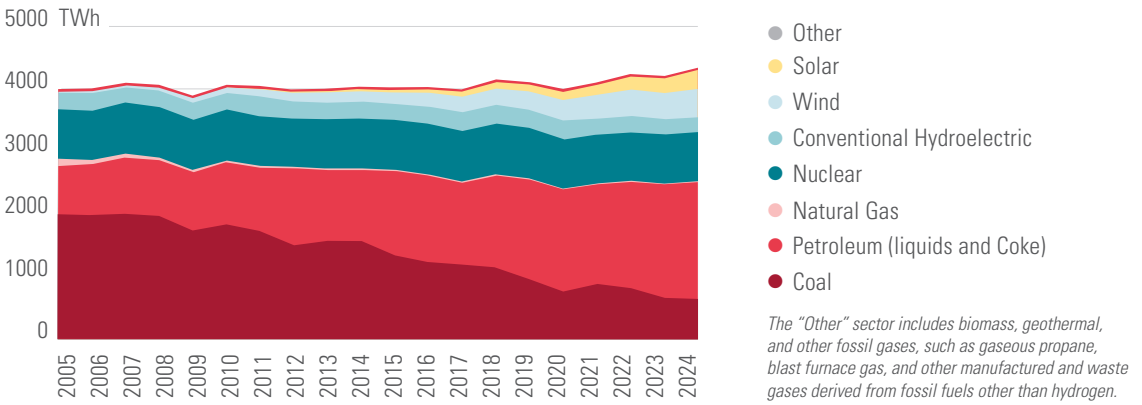


Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2022. (2024).

to 2024, coal generation fell by more than two-thirds, from 2,013 TWh to 653 TWh, while generation from natural gas and renewables rose (**Figure 2**). Wind generation increased to 453 TWh, making up 10% of total electricity in 2024. Solar generation increased to 303 TWh, contributing 7% of the total. Nuclear and hydroelectric generation have remained at historical levels.[21] Despite continued progress toward renewables, natural gas makes up 43% of the current generation mix, and accelerating its phasedown will be key to further decarbonizing the sector.

The transportation sector has seen positive trends for both vehicle use and fuel efficiency. From 1985 to 2020, vehicle miles traveled (VMT) has nearly doubled, from about 1.77 trillion miles to over 3.26 trillion miles (**Figure 3**). At the same time, light-duty vehicle fuel economy began to improve in 2005, increasing from 19.3 miles per gallon (mpg) in 2004 to 26.0 mpg by 2022, after years of decline.[23] This improvement reflects both the enactment of federal fuel economy standards and the development of newer, more efficient technologies. In addition to fuel efficiency improvements, however, decarbonizing the transportation sector will also require vehicle electrification, shifts to other transport modes, and compact urban planning to reduce VMT.

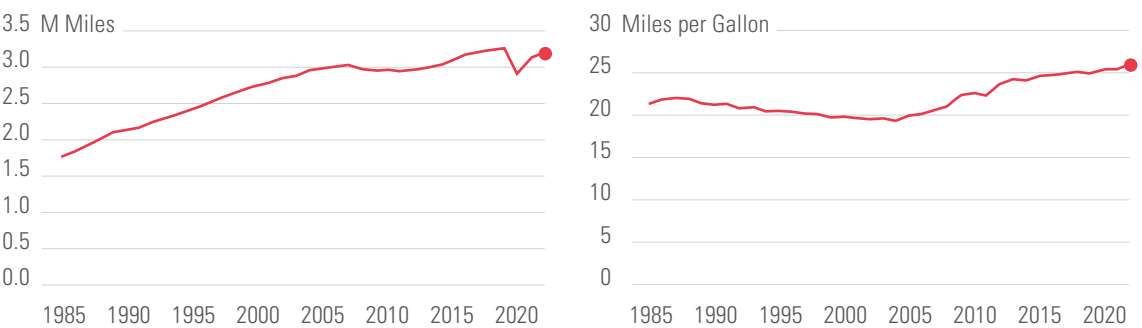
Figure 2. U.S. Net Electricity Generation by Energy Source



The "Other" sector includes biomass, geothermal, and other fossil gases, such as gaseous propane, blast furnace gas, and other manufactured and waste gases derived from fossil fuels other than hydrogen.

Source: Electricity data browser - Net generation for all sectors. U.S. Energy Information Administration. https://www.eia.gov/electricity/data/browser/.

Figure 3. Average Fuel Economy for New Light-Duty Vehicles and Total Vehicle Miles Traveled



Sources:
Bureau of Transportation Statistics. United States Department of Transportation https://www.bts.gov/.
The 2023 EPA Automative Trends Report. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10191S7.pdf (2023).

PROGRESS TOWARD NET ZERO

NDC and LTS targets

In November 2021, the Biden administration articulated a strategy to reach net-zero emissions by 2050, aligned with the 2030 NDC of reducing emissions by 50–52% below 2005 levels.[24,25] Later, in December 2024, the administration announced the third U.S. NDC, setting a target to reduce emissions by 61–66% below 2005 levels by 2035 to keep the 2050 net-zero target within reach.[26]

Consideration of the long-term perspective has helped drive policy progress under the Biden administration. The net-zero goal has brought attention to sectors like industry, aviation, and short-lived non-CO_2 climate pollutants, as well as carbon sinks and carbon removal technologies — all of which are crucial for limiting peak warming.[24] While these sectors are less important for cutting emissions in the near term, early action is needed to prepare for deep decarbonization.

Policy Highlights

U.S. climate targets under the Paris Agreement have led to the passing of historic climate laws, including the BIL in 2021 and the IRA in 2022, which invest over a trillion dollars into clean energy, energy efficiency, methane mitigation, climate resilience, and more.[27] Since their enactment, these laws have catalyzed $321 billion in private sector clean energy investments.[28] Notably, the IRA's household tax credit program has surpassed expectations, with 3.4 million households having invested $8 billion in clean energy technologies in 2023, including rooftop solar and heat pumps.[29] Furthermore, 77% of IRA investments have flowed to Republican-led districts, strengthening its bipartisan appeal.[28]

One of the IRA's most novel elements is its focus on investments in low-income and fossil-fuel-dependent communities to ensure an inclusive and equitable clean energy transition. Of note is the Greenhouse Gas Reduction Fund, which carves out $15 billion for low-income and disadvantaged communities to support community and rooftop solar and energy efficiency projects. Additionally, bonus tax credits are available for renewable projects that provide benefits to these communities. However, these investments depend on implementation at the state and local levels to generate tangible benefits for these communities.[30]

The U.S. government has also taken important steps to enact climate regulations. Corporate Average Fuel Economy standards, one of the longest-running regulations in the U.S., have achieved significant fuel savings and emissions reductions.[31] Additionally, standards on GHGs and other air pollutant emissions from fossil fuel power plants have been key mechanisms to phase down coal and natural gas generation.

While carbon pricing does not exist at the federal level, the United States has been an innovator in this space. In the 1990s, the Acid Rain program successfully utilized cap-and-trade to reduce sulfur dioxide emissions, serving as a proof of concept for carbon pricing. Starting with the Climate Stewardship Act of 2003, the United States has seen numerous carbon pricing proposals, though none passed both houses of Congress to become law. Notably, the "Waxman-Markey" bill in 2009 received bipartisan support and was approved by the House of Representatives, but ultimately did not pass the Senate.[32] Despite lack of action at the federal level, states like California and Washington have enacted their own cap-and-trade programs. California's cap and trade system is among the largest multi-sectoral trading systems globally, and the funds generated from the program are used to help state agencies implement programs to further reduce GHGs, with 35% of the revenue directed to disadvantaged and low-income communities.[33] Additionally, eleven states in northeastern U.S. participate in the Regional Greenhouse Gas Initiative (RGGI), which caps electricity sector emissions.[34] Following the formation of RGGI in 2005, the states have conducted periodic program reviews which implemented changes to improve the program design and reduce the emissions cap.

Many individual states have their own legislatively mandated climate targets; Maryland, for example, requires the state to reduce GHG emissions by 60% below 2006 levels by 2031 and achieve net-zero emissions by 2045.[35] New York's

Climate Leadership and Community Protection Act requires a 40% reduction in GHG emissions by 2030 and an 85% reduction by 2050.[36] States like California, Maryland, Colorado, Washington, and New York have also adopted comprehensive climate policies across sectors, including renewable energy standards,[37] zero-emission vehicle programs,[38] landfill methane regulations,[39] and building performance standards.[40]

Localities drive climate action by enacting climate action plans (CAPs) with strong clean energy goals and GHG emissions reduction targets across different sectors. The city of Milwaukee, Wisconsin, has a target to reduce GHG emissions by 45% by 2030 and achieve net zero by 2050;[41] the city of Tucson, Arizona, aims to increase its renewable energy share to 70% by 2035, with a plan to transition away from coal by 2032, and reduce carbon emissions by 80% by 2035.[42] Additionally, CAPs often include home energy upgrades, energy benchmarking and building performance standards, mode shift targets, electric vehicle adoption targets, vehicle emissions reduction targets, sustainable procurement policies, clean energy incentives, renewal of green infrastructure and green spaces, and zero waste programs.

City-led policies banning new sales of fossil-fuel powered appliances, such as New York City's 2024 ban on fossil fuels in new construction,[43] exist across the country, though they continue to face considerable legal pushback.[44]

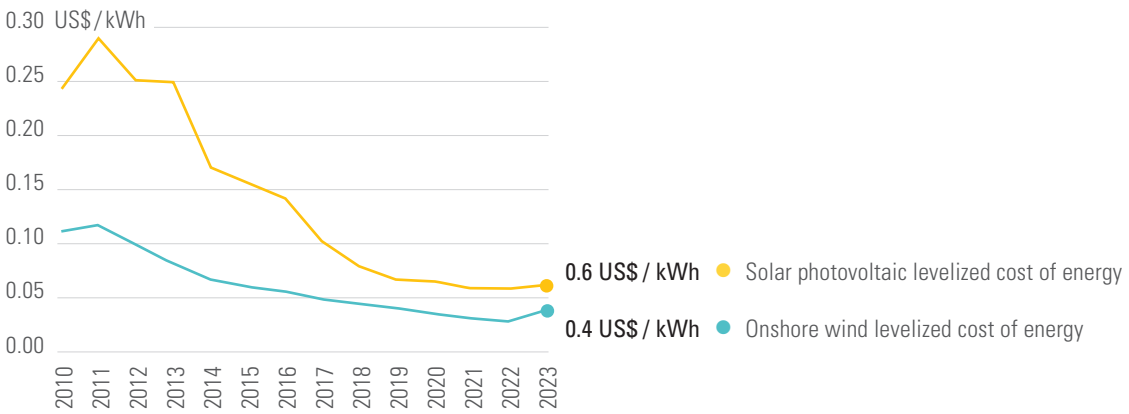
Under the current administration, states and cities have continued to pass ambitious climate policies, including New York City's congestion pricing program,[45] Oregon's new cap and trade program,[46] and California's state plan to deploy heat pumps.[47] Nearly half of U.S. states, as part of the *U.S. Climate Alliance*, have announced they will aim to achieve the emission reduction goals communicated in the 2035 U.S. NDC and 2050 net-zero target,[48] and a subset of these states launched a multi-state effort to promote clean vehicles.[49]

Sectoral Transitions: Progress

Over the past few decades, the United States has made some progress toward its net-zero target through the electricity, transport, and buildings sectors.

The electricity sector has cut coal-fired generation by more than two-thirds since 2005 while quickly expanding renewable energy deployment in recent years.[51] Coal is expected to continue retiring over the next decade, though supportive policies are needed to ensure the full phaseout and a just transition. The drop in coal power is mainly due to lower costs and better performance from natural gas and renewables, which have undercut coal's competitive advantage.[52] The levelized cost of energy for solar and wind has fallen sharply over the last decade (**Figure 4**) as a result of technology improvements, better

Figure 4. Levelized cost of energy for wind and solar energy in the United States



Source: Renewable Power Generation Costs in 2023. https://www.irena.org/Publications/2024/Sep/Renewable-Power-Generation-Costs-in-2023 (2024).

access to high-quality wind resources, more competitive supply chains, and lower operations and maintenance costs.[50] Federal and state-level policies have supported the growth in renewables.[53,54] Additionally, efficiency gains in the end-use sectors have helped drive down emissions from the electricity sector.[55]

In the transportation sector, the fuel efficiency of new light-duty vehicles has steadily improved since 2004 (**Figure 3**), and sales of hybrid-electric and electric vehicles (EVs) have accelerated over the last five years. From 2020 to 2025, EV sales rose from 238,540 to 1,247,656 vehicles, a 423% increase (Fig. 5). Plug-in hybrid-electric and conventional hybrid vehicle sales grew by 366% and 254%, respectively, over the same period. This growth is due in part to EV incentives under the IRA,[57] along with state-level EV incentives and mandates, which are becoming more widespread. The expansion of EV charging infrastructure has also played a key role in increased EV adoption. From 2015 to 2020, the number of EV charging ports in the United States. more than doubled, and in 2021 alone, it increased by over 55% relative to the previous year.[58] This expansion was supported in part by the IRA and BIL investments in EV infrastructure.[59,60] States have also provided funding and incentives for EV charging infrastructure; for example the California Electric Vehicle Infrastructure Project offers incentives for public EV chargers, prioritizing low-income and disadvantaged communities.[61]

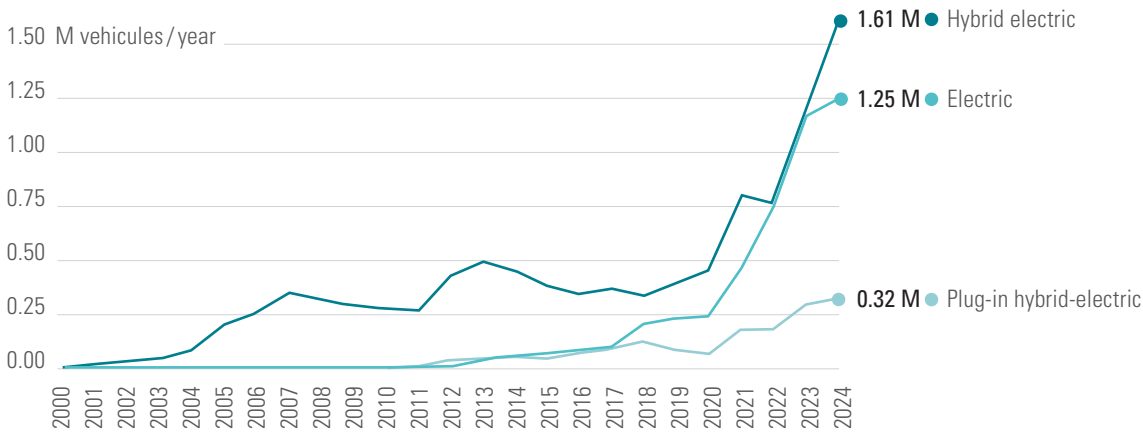
In the buildings sector, more stringent building codes, appliance standards, and other policies have led to increased electrification and energy efficiency improvements. Electric heat pumps have consistently outsold gas furnaces in recent years, with manufacturers shipping 32% more heat pumps than gas furnaces in 2024.[62]

Sectoral Transitions: Blockages

Despite substantial progress driven by the IRA, BIL, and other federal and state-level policies, there remain major obstacles to achieving a net-zero transition. Accelerating clean energy deployment has been a challenge in the United States. Many renewable energy projects are stalled in the interconnection queue due to transmission infrastructure constraints and permitting delays. As of the end of 2023, over 1 TW of solar and wind generating capacity were stuck in the interconnection queue.[63] At the same time, the rapid growth of data centers in the United States is expected to drive up electricity demand significantly, further highlighting the need to address these interconnection and transmission challenges.[64]

In the transport sector, reducing VMT and decarbonizing aviation, heavy-duty trucking, and shipping sectors have remained barriers. More than 20% of the U.S. population lives in suburban and rural areas, which are highly car-dependent.

Figure 5. Hybrid-Electric, Plug-in Hybrid-Electric, and Electric Vehicle Sales in the United States



Source: Light Duty Electric Drive Vehicles Monthly Sales Updates. Argonne National Laboratory https://www.anl.gov/esia/light-duty-electric-drive-vehicles-monthly-sales-updates.

Investing in adequate transport infrastructure and promoting a cultural shift towards the use of public transportation and alternative modes of transportation remain challenges.[65] Electrifying heavy-duty trucking requires a high upfront investment and is limited by the lack of charging infrastructure along highways.[66] Aircraft electrification is still too early in development to support commercial deployment.[67] Alternative options, like synthetic aviation fuels, green hydrogen, and ammonia, have emerged, but they are not being used at the scale needed for full decarbonization.[68,69]

In the buildings sector, the main challenges include the age of the existing building stock and the cost of Zero-Energy Building (ZEB) technologies. In some regions of the United States, a significant percentage of buildings are old, leading to a high cost of retrofit and a potential incompatibility with certain ZEB technologies like heat pumps.[70] Additionally, even though energy-efficient and electrified appliances lead to long-term savings, the upfront cost prevents low and medium-income households from purchasing them. There is also a risk that upgrading buildings with ZEB technologies may cause an increase in rental prices, thus placing a financial burden on low and middle-income households.[71]

The industrial sector has seen limited progress in decarbonization compared to other sectors. Industries such as iron and steel, chemicals, and petrochemicals have a high energy demand and emit carbon dioxide as part of their processes, making these industries difficult to decarbonize. Additionally, many of these technologies remain expensive and are not yet ready for commercial-scale deployment.[72] There is a need for additional investment to support commercial demonstrations and drive broader technological innovation in this sector.[73] Deployment of carbon capture and storage and carbon dioxide removal technologies has also faced limitations due to the cost and the need for development of infrastructure to transport and store the captured carbon, which needs further research and development to be deployed at a large scale.[74,75]

THE CRITICAL ROLE OF NON-FEDERAL ACTORS

Key features of the U.S. policymaking process

Climate policy in the United States reflects a complex interplay of federal leadership, state and local initiatives, subnational coalitions, and shifting political ideologies. Bipartisan support has occasionally emerged when climate action is framed around economic growth or national security; however, persistent political polarization and ideological resistance have repeatedly blocked comprehensive progress. Under the U.S. system of federalism, political power is divided between the federal, state, and local governments. The U.S. federal government is split between three branches: the executive branch, led by the President, the legislative branch, consisting of a bicameral Congress, and the judicial branch, led by the Supreme Court.[76] Each of these branches has the capacity to impact climate policy.

Numerous federal agencies execute laws passed by Congress by issuing regulations. The Environmental Protection Agency's duties include monitoring polluters, issuing permits and waivers, and enforcing statutes. The Department of Energy is notable for setting energy efficiency standards for appliances, managing nuclear energy regulation, and funding and facilitating research and development for energy systems, especially hard-to-decarbonize sectors. The Department of Transportation's management of infrastructure projects allows it to administer funds for mass transportation and EV infrastructure projects, while federal regulation of lands, forestry, and wildfire mitigation falls under the purview of the Department of Agriculture. The Department of the Interior manages federal lands and energy leasing within, while the National Oceanic and Atmospheric Administration is responsible for GHG emissions tracking, weather and climate tracking, and coastal and marine research, mitigation, and adaptation.

The legislative branch is divided between the House of Representatives and the Senate and is

responsible for passing legislation. Increasing political polarization[77] means that passing legislation is a difficult feat, especially for partisan issues like climate change. Within the U.S.'s two-party system, the Republican party tends to distrust science, which informs the party's climate denial and near-universal opposition to climate policies.[78] The judicial branch is responsible for interpreting, applying, and reviewing laws.[79] For example, the Supreme Court's 2007 ruling in Massachusetts v. EPA established that the Environmental Protection Agency can regulate greenhouse gases.[80] Similarly, lower courts can shape state and local climate laws by determining which regulations are within the rights of these jurisdictions.

During international climate negotiations, the U.S. is represented by a few extensions of the executive branch. The U.S. Special Presidential Envoy for Climate acts as the lead U.S. climate representative and negotiator and is supported by the Office of the Special Presidential Envoy for Climate.[81] Though other American leaders such as governors, mayors, and university presidents may be present at international meetings, they do not have direct authority to speak on behalf of the United States.

Climate policy has also become a focal point in a broader culture war marked by increasing Republican opposition toward progressive social frameworks like environmental justice and diversity, equity, and inclusion.[82,83] Programs linking climate action with equity, such as those established under the Biden administration's Justice40 Initiative, have become frequent targets of right-wing media and legal challenges.[84] While bipartisan narratives have occasionally advanced climate action, long-term progress remains hindered by ideological polarization. Advancing meaningful climate policy at the federal level will depend not only on future electoral outcomes but also on the capability of coalitions to effectively navigate this divide.

Subnational Climate Action

Under the U.S. federalist system of governance, states, cities, counties, and other jurisdictions have the capacity to enact climate policies, making them key drivers of climate action. For example, states arguably have more authority to control the electricity grid mix than the federal government, and the federal government has no ability to set nationwide building energy efficiency standards, as these are set by individual states. Local jurisdictions like cities and counties have more ability to control transportation and zoning strategies. However, climate action at the subnational level is limited by funding constraints, diversity of subnational interests, and, increasingly, federal hostility towards subnational climate action.

Numerous subnational actors have remained engaged with climate issues in the United States despite federal government inaction and rollbacks. California is a notable climate leader, especially in setting stricter air pollution standards for new vehicles. While the Clean Air Act generally blocks states from creating their own standards, California has been exempt because it adopted rules before the Act passed.[85] Its air board proposes new standards to the Environmental Protection Agency, and once approved, other states can adopt them, allowing stricter rules than federal ones. As of April 2025, 17 states and the District of Columbia have adopted some portion of California's vehicle regulations, representing nearly 40% of the U.S. light-duty vehicle market, and demonstrating the significant influence of these standards on the automobile industry.[86] However, in May 2025, the Senate voted to revoke California's emissions waivers.[87] Though California has already challenged the revocation through a multi-state lawsuit, this action poses a long-term threat to state-led transportation mitigation, as policies revoked under the Congressional Review Act cannot be reintroduced in a substantially similar form.

Cities and counties can also advance innovative climate policies that may later be adopted by other localities or state governments. In states that lack strong climate ambition, cities and counties can also play a leading role on addressing climate change. For example, Texas lacks strong statewide climate policies, but its capital city, Austin, has a 2040 net-zero target, driven in part by one of the most ambitious renewable port-

folio standards in the country and comprehensive plans to expand EV adoption and charging infrastructure.[88] Similar trends can be seen in cities like Miami, [89] Phoenix,[90] and Milwaukee,[41] where bold local climate initiatives have emerged despite relatively weak state-level support..

Many businesses have set net-zero targets for carbon emissions, including utility company Duke Energy, which plans to reach this goal by 2050.[91] Other businesses driving the clean energy transition include NextEra Energy Resources, Ørsted US, AES Corporation, Invenergy, and Pattern Energy, all of which are leading the way in developing large-scale wind, solar, battery storage, and transmission projects.

Non-governmental organizations such as the Natural Resources Defense Council, Environmental Defense Fund, Sierra Club, and Union of Concerned Scientists are also heavily involved in climate action. Through litigation, policy advocacy, public mobilization, and research, these organizations work to reduce GHG emissions, accelerate the clean energy transition, and hold governments and corporations accountable for meeting climate commitments.

Modeled National Pathways

Long-term U.S. modeling studies highlight the broader, sectoral trends needed to achieve net-zero, including a rapidly decarbonized electricity grid, electrification of end-use sectors, and the use of carbon dioxide removal technologies.[92,25,93] These studies tend to use a carbon price or constraint approach to achieve certain sectoral targets, rather than through specific policies. Shorter-term studies have assessed specific, sector-by-sector policies needed to achieve the U.S. 2030 and 2035 NDC, including clean electricity standards, accelerated permitting and siting of electricity transmission and renewables, enhanced incentives and sales targets for EVs, stronger building appliance standards that push the market towards all-electric appliances, and more stringent regulations on oil and gas sector methane.[94–98]

These analytical insights and targets have helped drive concrete policy discussions in the country. Zhao et al. (2024), for example, leveraged an extensive stakeholder engagement process with federal and non-federal actors to inform the 2035 NDC and identify barriers and opportunities across sectors.[94] This study used a version of the integrated assessment model (IAM) Global Change Analysis Model with 50-state resolution to represent a suite of plausible policies across all sectors of the economy from both federal and non-federal actors, with differing assumptions across states based on their potential to adopt ambitious climate policy in the United States. The use of an IAM allows for the simulation of sectoral interactions, and the 50-state resolution enables the modeling of specific state-level policies, including building efficiency standards and renewable energy standards.

In this study, two scenarios are modeled: a current policies scenario, which includes existing federal and state-level policies, and an enhanced ambition scenario, which layers on enhanced and new federal and state-level policies across sectors to help achieve a high-ambition 2035 NDC. To ensure the attainability of the enhanced ambition pathway, modeled policies are based on mechanisms that already exist or have been proposed in at least one state. However, the study does not capture different social, political, and behavioral factors that could create uncertainty in policy uptake. For example, while IRA provisions are modeled at full implementation, in reality, uptake of these provisions would depend on the actions of state, local, and individual actors. The durability of the modeled policies is also called into question, as different federal administrations can alter the climate landscape in significant ways.

Modeling studies have also highlighted the importance of subnational actions in driving down emissions in the United States, especially under less climate-friendly federal governments.[94,95,99,100] Zhao et al. (2025) found that enhanced climate leadership at subnational level has the potential to counteract much of the impacts of recent federal policy rollbacks, allowing the United States. to achieve GHG emissions reductions of 54-62% by 2035.[100] The high end of this range, which is based on how extensively federal policies are repealed, would meet the U.S. 2035 NDC.

CO-BENEFITS OF THE ENERGY TRANSITION

Beyond accelerating the clean energy transition and drawing down GHG emissions, climate policies can also yield health and economic co-benefits by reducing air pollutants and spurring economic growth associated with clean energy manufacturing. The Biden administration marked a pivotal shift in federal climate policy, centering decarbonization within a broader economic development agenda. This realignment culminated in the passage of the IRA, which was enacted through the budget reconciliation process.[101] The IRA's success was driven by strategic coalition-building that united progressive climate advocates, moderate Democrats and Republicans, and other key stakeholders.[102] By emphasizing job creation and economic revitalization in clean energy industries, the IRA garnered support from a diverse range of constituencies, including those in traditionally conservative regions.

Framing climate action as a national security imperative has also attracted bipartisan support. Reducing dependence on foreign oil has long been a strategic priority, driven by concerns over energy price volatility, supply disruptions, and the geopolitical influence of fossil fuel-exporting nations.[103] This security-based framing continues to resonate across party lines and has supported investments in renewable energy, EVs, and domestic manufacturing of critical technologies such as batteries and solar panels.[104]

Full implementation of the IRA and other federal climate policies have been associated with improved respiratory health, fewer working days lost, and reduced mortality from poor air quality.[105] They have also been linked to lower energy bills, as well as GDP and job gains.[106,107,108] The promotion of domestic clean energy manufacturing through IRA tax credits that provide domestic content requirements and bonuses can also reduce foreign energy dependence. These comprehensive benefits present an opportunity to reframe climate policy in the United States., especially under an unsupportive federal government.

INTERNATIONAL CLIMATE ENGAGEMENT

As the world's largest economy, the largest contributor to historical emissions, the second largest emitter today, and a major geopolitical and diplomatic actor, the United States has historically been a key and influential country in international climate diplomacy. Given that the authority and responsibility of international engagement mostly remain at the federal level, the alternating climate agendas under different federal administrations has generated both leadership and fundamental disruptions to global climate outcomes over the past 10 years.

Highlights of U.S. leadership include active bilateral and multilateral engagements before the Paris Agreement, effective influence over China's climate ambition and resulting joint global leadership, and the drawing of global policy attention to non-CO_2 emissions, especially methane. However, U.S. withdrawals from the Paris Agreement have led to significant distrust and risk of ambition rollback across countries.

Historical Leadership for Enhancing Ambition

In its climate-related international engagements, the United States has most heavily focused on supporting and implementing global climate ambition to maximize the possibility of achieving the Paris Agreement temperature goals. This strategy included broad international engagement and diplomacy as part of the UNFCCC and Paris Agreement structures, but also engagement bilaterally and in key regions. As part of that, engagement with China, the world's largest emitter, was a high priority. This bilateral US-China track yielded the important the Obama-Xi joint statement in November 2014, which catalyzed greater ambition in the Intended Nationally Determined Contributions across countries that became the core of the Paris Agreement.[109] Climate engagement with China dropped significantly during the first Trump administration, but restarted quickly after Biden took office despite challenges caused by the COVID-19 pandemic.

Strong dedication and trust between the top American and Chinese climate envoys played a pivotal role in the renewed U.S.-China climate cooperation and leadership.[110] At COP26, the two countries agreed on the Joint Glasgow Declaration, which identified key areas for collaboration including energy transition, methane, circular economy, and deforestation.[111] In 2023, the two countries released the Sunnylands statement calling for the 2035 NDCs to cover GHG emissions from all sectors of the economy, and they also co-convened the first methane and non-CO_2 summit with UAE at COP28, and the second one at COP29.[112] After the 2024 election, the U.S.-China bilateral engagements were dropped, but for the most part, the international outcomes that they fed into, such as language in various COP outcomes, remains.

The United States also initiated other global and regional actions outside the formal negotiations. One highlight emerging in Glasgow was the Global Methane Pledge, which sets the global goal of 30% methane reduction by 2030, to be achieved by improving emissions tracking and inventories, sharing knowledge on mitigation strategies and research, and raising private funds..[113] Additional international partnerships include the Just Energy Partnership (JETP) to finance coal phaseout in Indonesia and South Africa, and the Green Shipping Challenge with Norway. [114,115]

Opportunities for Subnational Engagement

Under the current administration's retrenchment of climate mitigation and international cooperation, collaboration with states, cities, and businesses may provide opportunities for engagement internationally. Though states and cities cannot enter into treaties with other nations or regions, they can identify opportunities for partnership and investment, share knowledge about success in policy design and implementation, sign memorandums of understanding or other agreements, and more.[76] Existing entities such as the Under2 Coalition, a network of subnational governments that advocates for subnational interests at international conferences and shares knowledge between members,[116] the International Zero Emission Vehicle Alliance, a collaboration between countries and subnational entities to encourage EV adoption,[117] the Pacific Coast Collaborative, a coalition of U.S. and Canadian cities,[118] and the Western Climate Initiative's emissions trading system[119] have previously provided forums for this type of engagement.

CONCLUSION

While historic climate legislation and regulations, subnational ambition, and market momentum have propelled U.S. climate action over the last decade, sharp political swings and implementation gaps have limited the country's ability to reduce emissions at the pace originally envisioned after Paris. Despite these challenges, the United States has made progress in retiring coal, deploying renewable energy, improving energy and fuel efficiency, addressing equity issues, and advancing electrification in the transportation and buildings sectors.

Looking ahead, subnational actors, including states, cities, and businesses, will have a critical role to play in sustaining U.S. climate ambition, accelerating the clean energy transition and advancing international partnership and action. Achieving the near-term NDCs and long-term net zero goal will require addressing natural gas phasedown, transmission expansion, freight electrification, VMT reductions, zero-emission building technology costs, and industrial sector decarbonization. Modeling studies, especially those that incorporate stakeholder engagement, can continue to provide insights on key policy levers in the near-term, as well as those that can lead to deeper reductions in mid-century. Importantly, the health, economic, and national security benefits of climate action offer a pathway to help bridge political divides and reframe climate policy in the United States.

REFERENCES

1 Webb, R. M. & Kurtz, L. Politics v. science: How President Trump's war on science impacted public health and environmental regulation. *Prog. Mol. Biol. Transl. Sci.* **188**, 65–80 (2022).

2 *Putting America First In International Environmental Agreements*. vol. Executive Order 14162 (2025).

3 *Unleashing American Energy*. vol. Executive Order 14154 (2025).

4 *Reinvigorating America's Beautiful Clean Coal Industry and Amending Executive Order 14241*. vol. Executive Order 15517 (2025).

5 *Protecting American Energy From State Overreach*. vol. Executive Order 14260 (2025).

6 *Zero-Based Regulatory Budgeting to Unleash American Energy*. vol. Executive Order 14270 (2025).

7 Carroll, A. C., Danya Gainor, Kate. Visualizing Trump's overhaul of the federal workforce | CNN Politics. *CNN* https://www.cnn.com/politics/tracking-federal-workforce-firings-dg (2025).

8 Stokstad, E. In 'blow to the environment,' EPA begins to dismantle its research office. *Science*.

9 Barkoff, S., Brennan, M., Schick, C., Cook, S. & Walsh, J. State Department enacts widespread layoffs, cutting 1,353 staff as part of reorganization - CBS News. *CBS News* (2025).

10 Langin, K. 'It's a nightmare.' U.S. funding cuts threaten academic science jobs at all levels. *Science*.

11 Wesseler, S. Can states and cities lead on climate under Trump? *Yale Climate Connections* http://yaleclimateconnections.org/2025/05/can-states-and-cities-lead-on-climate-under-trump/ (2025).

12 Mooney, A. & Millard, R. Investors in clean energy funds backtrack as rates and Donald Trump cloud outlook. *Financial Times* https://www.ft.com/content/2c8258ba-f7ab-4bd1-8c0c-e25b871812f4?utm_source=chatgpt.com (2025).

13 Gibson, K. The Trump Administration's Retreat From Global Climate Leadership. (2025).

14 Bergmann, M. The Transatlantic Alliance in the Age of Trump: The Coming Collisions. https://www.csis.org/analysis/transatlantic-alliance-age-trump-coming-collisions (2025).

15 America Is All In. America is all in. https://www.americaisallin.com/home.

16 Basseches, J. A. *et al.* Climate policy conflict in the U.S. states: a critical review and way forward. *Clim. Change* **170**, 32 (2022).

17 Jotzo, F., Depledge, J. & Winkler, H. US and international climate policy under President Trump. *Clim. Policy* **18**, 813–817 (2018).

18 Arroyo, V. From Paris to Pittsburgh: U.S. State and Local Leadership in an Era of Trump. (2019).

19 Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2022. (2024).

20 Hausfather, Z. Analysis: Why US carbon emissions have fallen 14% since 2005. *Carbon Brief* https://www.carbonbrief.org/analysis-why-us-carbon-emissions-have-fallen-14-since-2005/ (2017).

21 Electricity data browser - Net generation for all sectors. *U.S. Energy Information Administration* https://www.eia.gov/electricity/data/browser/.

22 Bureau of Transportation Statistics. *United States Department of Transportation* https://www.bts.gov/.

23 *The 2023 EPA Automative Trends Report*. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10191S7.pdf (2023).

24 *The Long-Term Strategy of the United States: Pathways to Net-Zero Greenhouse Gas Emissions by 2050*. https://bidenwhitehouse.archives.gov/wp-content/uploads/2021/10/US-Long-Term-Strategy.pdf (2021).

25 Horowitz, R. *et al.* The energy system transformation needed to achieve the US long-term strategy. *Joule* **6**, 1357–1362 (2022).

26 The United States of America Nationally Determined Contribution. (2024).

27 Lashof, D. Tracking Progress: Climate Action Under the Biden Administration. (2024).

28 *Clean Investment Monitor: Q1 2025 Update*. https://cdn.prod.website-files.com/64e31ae6c5fd44b10ff405a7/6823633247bb9cf92a074eb5_Clean%20Investment%20Monitor_Q1%202025.pdf (2025).

29 The Inflation Reduction Act: Saving American Households Money While Reducing Climate Change and Air Pollution. *U.S. Department of the Treasury* https://home.treasury.gov/news/featured-stories/the-inflation-reduction-act-saving-american-households-money-while-reducing-climate-change-and-air-pollution (2025).

30 Baker-Branstetter, S. & Chang, R. *The Inflation Reduction Act Reduces Emissions and Income Inequality*. https://www.americanprogress.org/article/the-inflation-reduction-act-reduces-emissions-and-income-inequality/ (2023).

31 Greene, D. L., Greenwald, J. M. & Ciez, R. E. U.S. fuel economy and greenhouse gas standards: What have they achieved and what have we learned? *Energy Policy* **146**, 111783 (2020).

32 Kennedy, K., Obeiter, M. & Kaufman, N. Putting a Price on Carbon: A Handbook for U.S. Policy Makers. *World Resources Institute* https://www.wri.org/research/putting-price-carbon (2015).

33 Cap-and-Trade Program. *California Air Resources Board* https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program.

34 The Regional Greenhouse Gas Initiative: an initiative of Eastern States of the US. (2025).

35 Maryland's Climate Pollution Reduction Plan. (2023).

36 Our Roadmap for Cleaner Air and Healthier Communities. *New York State Energy Research and Development Authority* https://climate.ny.gov/.

37 Renewables Portfolio Standard (RPS) Program. *California Public Utilities Commission* https://www.cpuc.ca.gov/rps/.

38 Zero-Emission Vehicle Program. *California Air Resources Board* https://ww2.arb.ca.gov/our-work/programs/zero-emission-vehicle-program.

39 Slanger, D. The Domino Effect: How States Are Leading the Charge on Landfill Methane. *RMI* https://rmi.org/the-domino-effect-how-states-are-leading-the-charge-on-landfill-methane/ (2025).

40 Building Performance Standards. *U.S. Department of Energy Office of Energy Efficiency & Renewable Energy* https://www.energycodes.gov/BPS.

41 Milwaukee Climate & Equity Plan. *City of Milwaukee Environmental Collaboration Office* https://city.milwaukee.gov/climate/Climate-Plan.

42 Resilient Together. https://climateaction.tucsonaz.gov/pages/caap.

43 *LOCAL LAWS OF THE CITY OF NEW YORK FOR THE YEAR 2021: No. 154*. (2021).

44 CRA V. CITY OF BERKELEY, No. 21-16278 (9th Cir. 2023). *Justia U.S. Law* https://law.justia.com/cases/federal/appellate-courts/ca9/21-16278/21-16278-2023-04-17.html (2023).

45 Kaske, M. NYC Congestion Toll Cuts Manhattan Gridlock by 25%, RPA Reports. Bloomberg.com (2025).

46 Samayoa, M. Oregon to reinstate ambitious climate program amid divided reactions from industries, environmentalists. *OPB* https://www.opb.org/article/2024/11/21/oregon-restart-climate-protection-program/ (2024).

47 Takemura, A. California unveils first state plan to unleash heat pumps. *Canary Media* https://www.canarymedia.com/articles/heat-pumps/california-unveils-first-state-plan-to-unleash-heat-pumps (2025).

48 About: United States Climate Alliance. *U.S. Climate Alliance* https://usclimatealliance.org/about/.

49 U.S. Climate Alliance Governors Launch Affordable Clean Cars Coalition to Expand Americans' Access to Newer and Cleaner Vehicles. *U.S. Climate Alliance* https://usclimatealliance.org/press-releases/alliance-governors-launch-affordable-clean-cars-coalition-may-2025/ (2025).

50 *Renewable Power Generation Costs in 2023*. https://www.irena.org/Publications/2024/Sep/Renewable-Power-Generation-Costs-in-2023 (2024).

51 US Energy Information Administration. Annual Electric Power Industry Report, Form EIA-861 detailed data files. https://www.eia.gov/electricity/data/eia861/ (2023).

52 Kolstad, C. What Is Killing the US Coal Industry? *Stanford Institute for Economic Policy Research* https://siepr.stanford.edu/publications/policy-brief/what-killing-us-coal-industry (2017).

53 Mai, T., Cole, W., Lantz, E., Marcy, C. & Sigrin, B. *Impacts of Federal Tax Credit Extensions on Renewable Deployment and Power Sector Emissions*. https://docs.nrel.gov/docs/fy16osti/65571.pdf (2016).

54 Joshi, J. Do renewable portfolio standards increase renewable energy capacity? Evidence from the United States. *J. Environ. Manage.* **287**, 112261 (2021).

55 Electric Power Sector Emissions. *United States Environmental Protection Agency* https://www.epa.gov/ghgemissions/electric-power-sector-emissions.

56 Light Duty Electric Drive Vehicles Monthly Sales Updates. *Argonne National Laboratory* https://www.anl.gov/esia/light-duty-electric-drive-vehicles-monthly-sales-updates.

57 Allcott, H., Kane, R., Maydanchik, M. S., Shapiro, J. S. & Tintelnot, F. *The Effects of "Buy American": Electric Vehicles and the Inflation Reduction Act*. https://www.nber.org/papers/w33032 (2024) doi:10.3386/w33032.

58 Alternative Fuels Data Center: Electric Vehicle Charging Infrastructure Trends. *U.S. Department of Energy* https://afdc.energy.gov/fuels/electricity-infrastructure-trends.

59 Alternative Fuel Vehicle Refueling Property Credit. *Internal Revenue Service* https://www.irs.gov/credits-deductions/alternative-fuel-vehicle-refueling-property-credit.

60 Alternative Fuels Data Center: Charging and Fueling Infrastructure Grants. *U.S. Department of Energy* https://afdc.energy.gov/laws/12732.

61 EV Charging for All. *CAL eVIP* https://calevip.org/.

62 Tracking the Heat Pump & Water Heater Market in the United States. *Rocky Mountain Institute* https://rmi.org/insight/tracking-the-heat-pump-water-heater-market-in-the-united-states/ (2025).

63 Queued Up: Characteristics of Power Plants Seeking Transmission Interconnection. *Berkeley Lab: Energy Markets & Policy* https://emp.lbl.gov/queues.

64 *Powering Intelligence: Analyzing Artificial Intelligence and Data Center Energy Consumption*. https://www.epri.com/research/products/3002028905 (2024).

65 Nation's Urban and Rural Populations Shift Following 2020 Census. *United States Census Bureau* https://www.census.gov/newsroom/press-releases/2022/urban-rural-populations.html (2022).

66 Fleming, K. L., Brown, A. L., Fulton, L. & Miller, M. Electrification of Medium- and Heavy-Duty Ground Transportation: Status Report. *Curr. Sustain. Energy Rep.* **8**, 180–188 (2021).

67 Schwab, A., Thomas, A., Bennett, J., Robertson, E. & Cary, S. Electrification of Aircraft: Challenges, Barriers, and Potential Impacts. (2021).

68 Kennedy, K. & Feldmann, J. Decarbonizing Freight: Opportunities and Obstacles for Clean Fuels. https://www.wri.org/insights/decarbonizing-freight-clean-fuels (2023).

69 Decarbonizing Aviation. *Rocky Mountain Institute* https://rmi.org/decarbonizing-aviation/.

70 Nadel, S. Electrification in the Transportation, Buildings, and Industrial Sectors: a Review of Opportunities, Barriers, and Policies. *Springer Nat.* **6**, 158–168 (2019).

71 Decarbonizing the U.S. Economy by 2050: A National Blueprint for the Buildings Sector. (2024).

72 Gross, S. The challenge of decarbonizing heavy industry. *Brookings* https://www.brookings.edu/articles/the-challenge-of-decarbonizing-heavy-industry/ (2021).

73 Industrial Decarbonization Roadmap. (2022).

74 Gonzales, V., Krupnick, A. & Dunlap, L. Carbon Capture and Storage 101. *Resources for the Future* https://www.rff.org/publications/explainers/carbon-capture-and-storage-101/ (2022).

75 Jones, W. *et al. The Landscape of Carbon Dioxide Removal and US Policies to Scale Solutions*. https://rhg.com/research/carbon-dioxide-removal-us-policy/ (2024).

76 The Constitution of the United States of America.

77 Heltzel, G. & Laurin, K. Polarization in America: two possible futures. *Curr. Opin. Behav. Sci.* **34**, 179–184 (2020).

78 Bugden, D. Denial and distrust: explaining the partisan climate gap. *Clim. Change* **170**, 34 (2022).

79 Marbury v. Madison, 5 U.S. 137 (1803). *Justia Law* https://supreme.justia.com/cases/federal/us/5/137/.

80 Massachusetts v. EPA, 549 U.S. 497 (2007). *Justia Law* https://supreme.justia.com/cases/federal/us/549/497/.

81 Office of the U.S. Special Presidential Envoy for Climate. *United States Department of State* https://2021-2025.state.gov/bureaus-offices/secretary-of-state/office-of-the-u-s-special-presidential-envoy-for-climate/.

82 Department of Justice Terminates Environmental Justice Settlement Agreement, Advancing President Trump's Mandate to End Illegal DEI and Environmental Justice Policies. *United States Department of Justice* https://www.justice.gov/opa/pr/department-justice-terminates-environmental-justice-settlement-agreement-advancing-president (2025).

83 Nicolaus, T. Environmental justice work targeted by Trump DEI orders. *Nations Health* **55**, 1–10 (2025).

84 Ali Kanu, H. Trump's DEI Purge Sweeps Up Race-Neutral Environmental Justice Program. *The American Prospect* (2025).

85 Vehicle Emissions California Waivers and Authorizations. *United States Environmental Protection Agency* https://www.epa.gov/state-and-local-transportation/vehicle-emissions-california-waivers-and-authorizations.

86 States that have Adopted California's Vehicle Regulations. *California Air Resources Board* https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program/states-have-adopted-californias-vehicle-regulations?utm_source=chatgpt.com (2025).

87 Domonoske, C. Upending norms, the Senate votes to undo California's EV rules. *NPR* (2025).

88 Munoz, L. U.S. Cities Leading the Way Toward Net Zero. *Climate Advisers* https://www.climateadvisers.org/insightsfeed/u-s-cities-leading-the-way-toward-net-zero/ (2024).

89 Miami Forever Climate Ready. *City of Miami* https://www.miami.gov/My-Government/Climate-Change-in-the-City-of-Miami/Climate-Change-Action/MiamiForeverClimateReady.

90 2025 Climate Action Plan. *City ogf Phoenix* https://www.phoenix.gov/administration/departments/oep/climate-change/climate-action-plan.html.

91 How Duke Energy will reach net-zero carbon emissions. *Duke Energy* https://illumination.duke-energy.com/articles/how-duke-energy-will-reach-net-zero-carbon-emissions.

92 Williams, J. *et al.* Carbon-Neutral Pathways for the United States. *AGU Adv.* **2**, (2021).

93 Browning, M. *et al.* Net-zero CO_2 by 2050 scenarios for the United States in the Energy Modeling Forum 37 study. *Energy Clim. Change* **4**, 100104 (2023).

94 Zhao, A. *et al. Toward 2035: Forging a High-Ambition U.S. Climate Pathway*.

95 Zhao, A. *et al.* High-ambition climate action in all sectors can achieve a 65% greenhouse gas emissions reduction in the United States by 2035. *Npj Clim. Action* **3**, 63 (2024).

96 Mahajan, M., Orvis, R., Gopal, A., O'Brien, D. & Goldstein, R. *The Second Half Of The Decisive Decade: Potential U.S. Pathways On Climate, Jobs, And Health*. https://energyinnovation.org/report/the-second-half-of-the-decisive-decade-potential-u-s-pathways-on-climate-jobs-and-health/ (2024).

97 King, B. *et al. Pathways to Paris: Post-IRA Policy Action to Drive US Decarbonization*. 9 https://rhg.com/research/ira-us-climate-policy-2030/ (2023).

98 Iyer, G. *et al.* A multi-model study to inform the United States' 2035 NDC. *Nat. Commun.* **16**, 643 (2025).

99 Hultman, N. E. *et al.* Fusing subnational with national climate action is central to decarbonization: the case of the United States. *Nat. Commun.* **11**, 5255 (2020).

100 Zhao, A. *et al. Advancing U.S. Climate Action Under Federal Policy Rollbacks*. (2025).

101 INFLATION REDUCTION ACT OF 2022. *U.S. Department of Energy* https://www.energy.gov/lpo/inflation-reduction-act-2022.

102 Moraal, M., Mueller, E. & Winnick, H. Climate, Jobs, and Growth: How Coalitions Powered Biden's Legislation to Decarbonize America. *Heinrich Böll Stiftung* https://us.boell.org/en/2023/09/20/climate-jobs-and-growth-how-coalitions-powered-bidens-legislation-decarbonize-america (2023).

103 Energy Independence and Security. *U.S. Department of Energy* https://www.energy.gov/eere/energy-independence-and-security.

104 The durable, bipartisan effects of emphasizing the cost savings of renewable energy. *Yale Program on Climate Change Communication* https://climatecommunication.yale.edu/publications/the-durable-bipartisan-effects-of-emphasizing-the-cost-savings-of-renewable-energy/.

105 Kumar, A. *et al.* The projected impact of the inflation reduction act's climate provisions on cardiovascular and respiratory outcomes. *Am. J. Prev. Cardiol.* **19**, 100707 (2024).

106 Zhao, A. *et al. U.S. Clean Energy Policy Rollbacks: The Economic and Public Health Impacts Across States*. 26 https://cgs.umd.edu/research-impact/publications/us-clean-energy-policy-rollbacks-economic-and-public-health-impacts (2025).

107 King, B., Kolus, H., Gaffney, M., van Brummen, A. & Larsen, J. *The Stakes for Energy Costs in Budget Reconciliation*. https://rhg.com/research/the-stakes-for-energy-costs-in-budget-reconciliation/ (2025).

108 Orvis, R., Mahajan, M., Goldstein, R. & Ashmoore, O. *Inflation Reduction Act Repeal Harms State Economies, Raises Consumer Costs*. https://energyinnovation.org/report/inflation-reduction-act-repeal-harms-state-economies-raises-consumer-costs/ (2025).

109 U.S.-China Joint Presidential Statement on Climate Change. whitehouse.gov https://obamawhitehouse.archives.gov/the-press-office/2015/09/25/us-china-joint-presidential-statement-climate-change (2015).

110 Kerry and Xie exit roles that defined generation of climate action. *AP News* https://apnews.com/article/john-kerry-xie-zhenhua-climate-change-7af155358898a7533946228e110caf50 (2024).

111 U.S.-China Joint Glasgow Declaration on Enhancing Climate Action in the 2020s. *United States Department of State* https://2021-2025.state.gov/u-s-china-joint-glasgow-declaration-on-enhancing-climate-action-in-the-2020s/.

112 Sunnylands Statement on Enhancing Cooperation to Address the Climate Crisis. *United States Department of State* https://2021-2025.state.gov/sunnylands-statement-on-enhancing-cooperation-to-address-the-climate-crisis/.

113 Fast action on methane to keep 1.5° future within reach. *Global Methane Pledge* https://www.globalmethanepledge.org/.

114 Just Energy Transition Partnerships: Toward a Collective Assessment. (2023).

115 FACT SHEET: President Biden to Galvanize Global Action to Strengthen Energy-Security and Tackle the Climate Crisis through the Major Economies Forum on Energy and Climate. *The White House* https://bidenwhitehouse.archives.gov/briefing-room/statements-releases/2022/06/17/fact-sheet-president-biden-to-galvanize-global-action-to-strengthen-energy-security-and-tackle-the-climate-crisis-through-the-major-economies-forum-on-energy-and-climate/ (2022).

116 Under2 Coalition. *Climate Group* https://www.theclimategroup.org/under2-coalition.

117 Members. *ZEV Alliance* https://zevalliance.org/members/.

118 Pacific Coast Collaborative: *Pacific Coast Collaborative* https://pacificcoastcollaborative.org/.

119 Greenhouse gas emissions trading: a cost-effective solution to climate change. *Western Climate Initiative, Inc.* https://wci-inc.org.